WHAT IS CLAIMED IS:

1. Apparatus for processing light, comprising:

(a) an emitter for transmitting light including multiple wavelength bands generally along an axis, each band including a distinct related range of collateral wavelengths;

(b) a plurality of spatially positioned receptors;

(c) a diffracting member for diffracting said wavelength bands to various of said receptors; and

(d) a controller for selectively adjusting said diffracting member to independently vary the receptor to which each wavelength band is diffracted.

2. Apparatus in accordance with Claim 1 wherein said diffracting member is a controllable diffraction grating.

3. Apparatus in accordance with Claim 2 wherein said controllable diffraction grating comprises a plurality of diffractive elements, each element being individually controllable by said controller.

4. Apparatus in accordance with Claim 3 wherein said elements

effect diffraction by regulating the relative phase of light of said wavelength bands emanating from each element.

5. Apparatus in accordance with Claim 2 wherein said controller is programmable.

6. Apparatus in accordance with Claim 5 wherein said diffractive elements are controlled by said controller to vary the relative positions thereof to effect diffraction of said wavelength bands.

7. Apparatus in accordance with Claim 5 wherein said diffractive elements are reflective.

8. Apparatus in accordance with Claim 5 wherein said diffractive elements are transmissive.

9. Apparatus in accordance with Claim 2 wherein said elements effect diffraction by regulating amplitude of said wavelength bands.

10. An optical processor, comprising:

(a) an optical input transmitting a plurality of copropagating optical signals, each signal having a distinct wavelength band;

(b) a plurality of optical outputs;

(c) a variably controllable diffraction grating member including a plurality of diffractive elements, wherein one of the relative phase shift and amplitude of said copropagating optical signals processed by each element is individually controlled; and

(d) a controller operatively connected to the variable diffraction grating member to control the wavelength bands so as to direct the plurality of copropagating optical signals to selected one or more of said optical outputs.

11. An optical processor in accordance with Claim 10 wherein the copropagating optical signals define communications information.

12. An optical processor in accordance with Claim 10 further comprising optics intermediate said optical input and said variable diffraction grating member to direct a copropagating optical signal onto said variable diffraction grating member.

13. An optical processor in accordance with Claim 12 further comprising optics intermediate said variable diffraction grating member and an optical output to direct a copropagating optical signal onto a corresponding, selected optical output.

14. An optical processor in accordance with Claim 10 wherein said optical input comprises an emitting end surface of an optical fiber.

15. An optical processor in accordance with Claim 10 wherein said optical outputs comprise end surfaces of respective optical fibers.

16. An optical processor in accordance with Claim 10 wherein said optical input comprises a light-emitting region of an optical wave guide.

17. An optical processor in accordance with Claim 10 wherein said optical outputs comprise input surfaces of respective optical wave guides.

18. An optical processor in accordance with Claim 10 wherein said elements of said variable diffraction grating member are

reflective.

19. An optical processor in accordance with Claim 10 wherein said elements of said variable diffraction grating member are transmissive.

20. An optical processor in accordance with Claim 10 wherein said diffractive elements are controlled by said grating member to vary the relative positions thereof to effect diffraction of the wavelength band of each copropagating optical signal.

21. An optical processor in accordance with Claim 10 wherein said processor comprises a plurality of optical inputs, each transmitting a copropagating optical signal having a distinct wavelength band.

22. An optical processor in accordance with Claim 10 wherein said controller is electrically operated.

23. A method of processing light emanating from an input and directing each of multiple distinct wavelength bands of the light to a desired receptor, comprising the steps of:

(a) directing the light along an axis;

(b) diffracting the wavelength bands of the light in different directions; and

(c) selectively varying the direction of each wavelength band to a receptor independent of other wavelength bands.

24. A method in accordance with Claim 23 further comprising the step of allowing redirection of each wavelength band to a different one of multiple receptors.

25. A method for directing a particular wavelength band of a plurality of wavelength bands of incoming light, comprising the steps of:

providing a diffraction grating including a plurality of diffraction grating elements;

calculating a position and orientation of each diffraction grating element necessary to direct a wavelength band of the incoming light to a predetermined output location; and

positioning the diffraction grating elements in calculated positions and orientations to diffract the wavelength bands of light to predetermined output locations.

26. An optical processor, comprising:

(a) a plurality of optical inputs, each transmitting one or more copropagating optical signals, each signal having a distinct wavelength band;

(b) an optical output;

(c) a variably controllable diffraction grating member including a plurality of elements, wherein one of the relative phase shift and amplitude of said copropagating optical signals processed by each element is individually controlled; and

(d) a controller operatively connected to the variable diffraction grating member to control wavelength bands so as to direct the plurality of copropagating optical signals to said optical output.

27. An optical processor in accordance with Claim 26 wherein said controller is operatively connected to the variable diffraction grating member to control the wavelength bands so as to direct the plurality of copropagating optical signals to a plurality of optical outputs.

28. A wavelength selective optical switch for directing one wavelength band of multiple bands of incoming light transmitted

by an emitter, comprising:

(a) a controllable diffraction grating comprising a plurality of grating elements for diffracting the incoming light; and

(b) a controller for selectively adjusting a position of each grating element, wherein a direction in which each wavelength band of light is individually and selectively diffracted to a desired location is controlled.

29. A switch according to Claim 28, wherein said controller is configured to adjust one or more of said grating elements, and wherein adjustment of said grating elements changes the direction in which each wavelength band of light is individually and selectively diffracted to predetermined locations.

30. A switch according to Claim 28, wherein said controller electrostatically adjusts the position of each of said grating elements.

31. A method for directing a plurality of wavelength bands of incoming light, comprising the steps of:

providing a diffraction grating including a plurality of

diffraction grating elements;

determining locations of the plurality of diffraction grating elements necessary to direct wavelength bands of the incoming light to desired output locations; and

positioning the plurality of diffraction grating elements at the determined locations to selectively diffract a wavelength band of light to a predetermined output location independently of other of the wavelength bands.